TFT LCD Approval Specification

MODEL NO.: M215H1-P01

- CONTENTS -

Version 2.1

Doc No.: 400039701
Issued Date: Oct.,22 2009
Model No.: M215H1-P01

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REVISION HISTORY

Version	Date	Section	Description

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1. GENERAL DESCRIPTION

1.1 OVERVIEW

The M215H1-P01 is a 21.5" wide TFT LCD cell with driver ICs and a 30-pin 2ch-LVDS circuit board. The product supports 1920 x 1080 Full HD (16:9 wide screen) mode. The backlight unit is not built in.

1.2 FEATURES

- Super wide viewing angle

- High contrast ratio

- Response time 5ms.

- Full HD (1920 x 1080 pixels) resolution

- DE (Data Enable) only mode.

- LVDS (Low Voltage Differential Signaling) interface.

- RoHS compliance.

1.3 APPLICATION

- TFT LCD Monitor

- TFT LCD TV

1.4 GENERAL SPECIFICATI0NS

Item	Specification	Unit	Note
Diagonal Size	21.53	inch	-
Active Area	476.64 (H) x 268.11 (V)	mm	(1)
Driver Element	a-si TFT active matrix	-	-
Pixel Number	1920 x R.G.B. x 1080	pixel	-
Pixel Pitch	0.248(H) x 0.248(V)	mm	-
Pixel Arrangement	RGB vertical stripe	-	-
Display Colors	16.7 millions	color	-
Transmissive Mode	Normally White	-	-
Surface Treatment	Hard coating (3H), AG (Haze 25%)	-	-
Power Consumption	5.3	Watt	(3)

1.5 MECHANICAL SPECIFICATIONS

Item	Min.	Typ.	Max.	Unit	Note
Weight	-	590	610	g	-
I/F connector mounting position	The mounting inclination of the connector makes the screen center within ±0.5mm as the horizontal.			-	(2)

Note (1) Please refer to the attached drawings for more information of front and back outline dimensions.

Note (2) Connector mounting position

Note (3) Please refer to sec.3.1 for more information of power consumption.

$+/- 0.5mm$
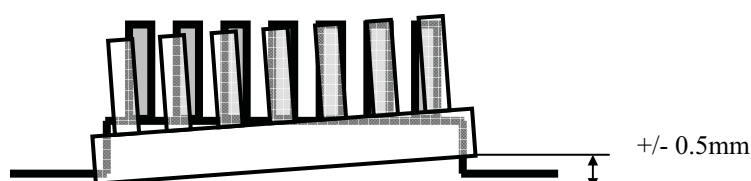
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2. ABSOLUTE MAXIMUM RATINGS

2.1 ABSOLUTE RATINGS OF ENVIRONMENT (BASED ON CMO MODULE M215H1-L01)

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Storage Temperature	T_{ST}	-20	+60	ºC	(1)
Operating Ambient Temperature	T_{OP}	0	+50	ºC	(1), (2)

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3. ELECTRICAL CHARACTERISTICS

3.1 TFT LCD OPEN CELL

Ta = 25 ± 2 ºC

Parameter		Symbol	Value			Unit	Note
			Min.	Typ.	Max.		
Power Supply Voltage		Vcc	4.5	5.0	5.5	V	-
Ripple Voltage		V_{RP}	-	-	300	mV(p-p)	-
Power On Rush Current		I_{RUSH}	-	-	3	A	(2)
Power Supply Current	White	-	-	0.51	0.61	A	(3)a
	Black	-	-	1.05	1.26	A	(3)b
	Vertical Stripe	-	-	1.06	1.26	A	(3)c
Power Consumption		P_{LCD}	-	5.3	6.3	Watt	(4)
LVDS differential input voltage		Vid	100	-	600	mV	
LVDS common input voltage		Vic	1.0	1.2	1.4	V	

Note (1) The product should be always operated within above ranges.

Note (2) Power On Rush Current Measurement Conditions: (must follow power sequence)
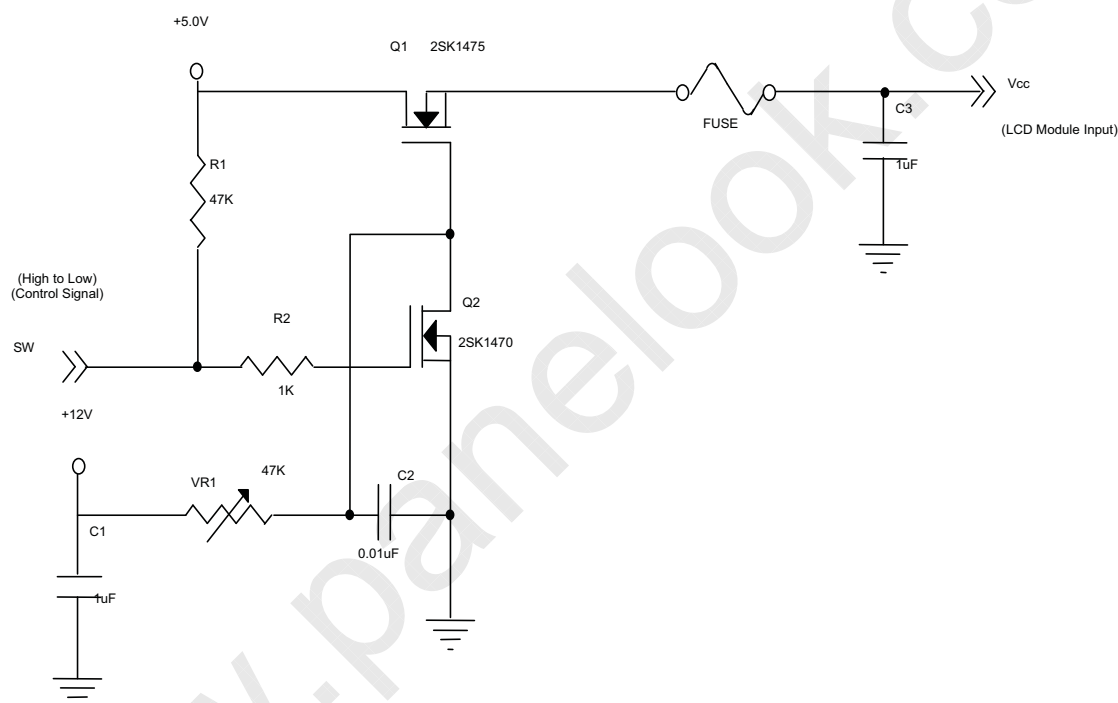
Vcc rising time is 470μs

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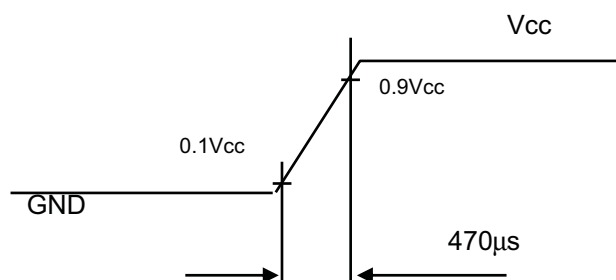
Note (3) The specified power supply current is under the conditions at Vcc = 5.0 V, Ta = 25 ± 2 ºC, f_v = 60 Hz, whereas a power dissipation check pattern below is displayed.

a. White Pattern

Active Area

b. Black Pattern
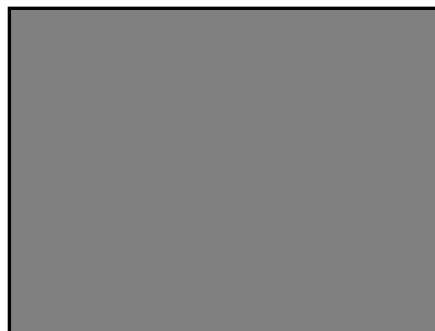
Active Area

c. Vertical Stripe Pattern

Active Area

Note (4) The power consumption is specified at the pattern with the maximum current

3.2 Vcc POWER DIP CONDITON

Vcc

4.5V

4.0V

Td

Dip condition:　$4.0V \leq Vcc \leq 4.5V, Td \leq 20ms$

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4. BLOCK DIAGRAM

4.1 TFT LCD OPEN CELL

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5. INPUT TERMINAL PIN ASSIGNMENT

5.1 TFT LCD OPEN CELL

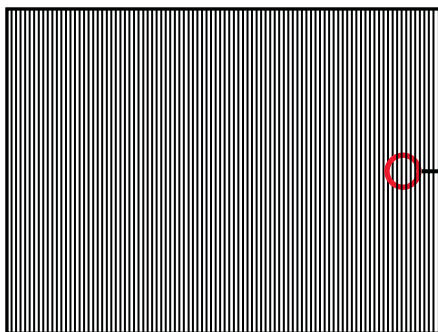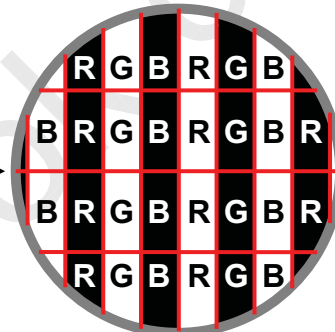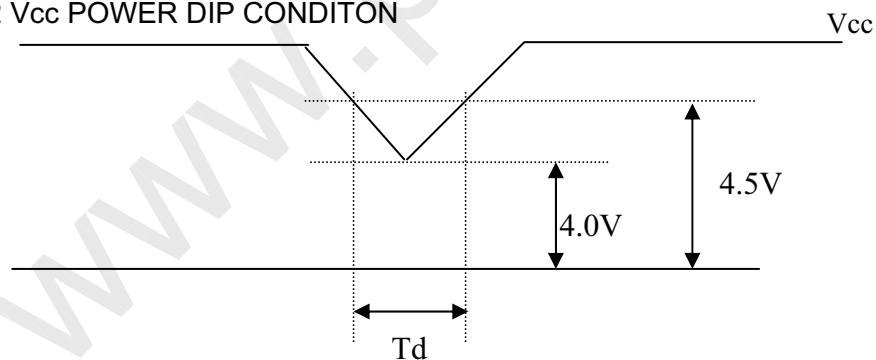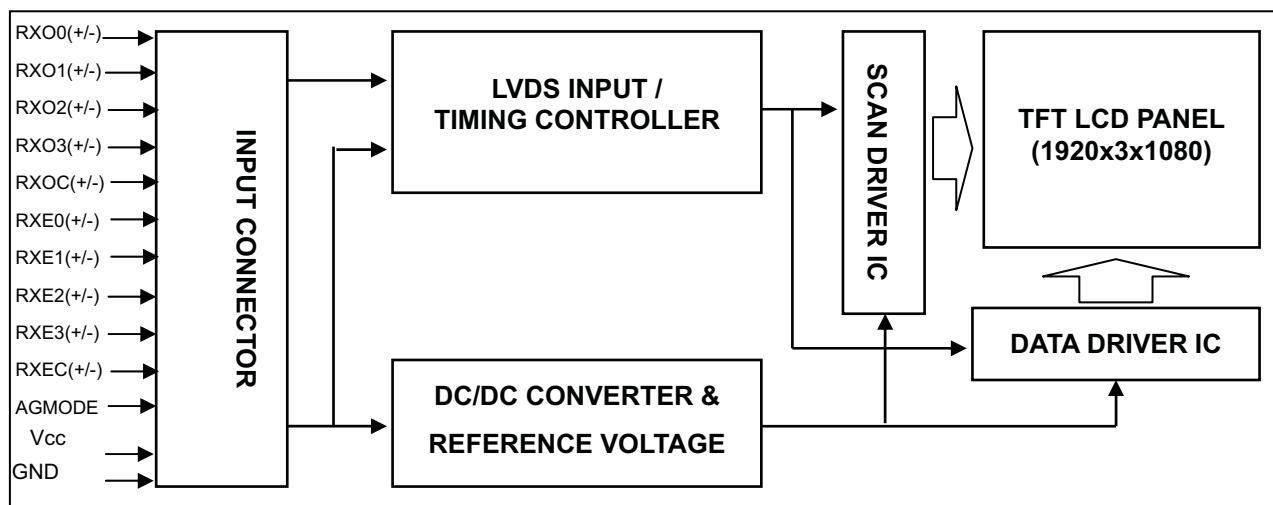| Pin	Name	Description
1	RXO0-	Negative LVDS differential data input. Channel O0 (odd)
2	RXO0+	Positive LVDS differential data input. Channel O0 (odd)
3	RXO1-	Negative LVDS differential data input. Channel O1 (odd)
4	RXO1+	Positive LVDS differential data input. Channel O1 (odd)
5	RXO2-	Negative LVDS differential data input. Channel O2 (odd)
6	RXO2+	Positive LVDS differential data input. Channel O2 (odd)
7	GND	Ground
8	RXOC-	Negative LVDS differential clock input. (odd)
9	RXOC+	Positive LVDS differential clock input. (odd)
10	RXO3-	Negative LVDS differential data input. Channel O3(odd)
11	RXO3+	Positive LVDS differential data input. Channel O3 (odd)
12	RXE0-	Negative LVDS differential data input. Channel E0 (even)
13	RXE0+	Positive LVDS differential data input. Channel E0 (even)
14	GND	Ground
15	RXE1-	Negative LVDS differential data input. Channel E1 (even)
16	RXE1+	Positive LVDS differential data input. Channel E1 (even)
17	GND	Ground
18	RXE2-	Negative LVDS differential data input. Channel E2 (even)
19	RXE2+	Positive LVDS differential data input. Channel E2 (even)
20	RXEC-	Negative LVDS differential clock input. (even)
21	RXEC+	Positive LVDS differential clock input. (even)
22	RXE3-	Negative LVDS differential data input. Channel E3 (even)
23	RXE3+	Positive LVDS differential data input. Channel E3 (even)
24	GND	Ground
25	NC	Not connection, this pin should be open.
26	NC	Not connection, this pin should be open.
27	NC	Not connection, this pin should be open.
28	VCC	+5.0V power supply
29	VCC	+5.0V power supply
30	VCC	+5.0V power supply

Note (1) Connector Part No.: 093G30-B2001A(STARCONN) or 187045-30091(P-TWO)

Note (2) The first pixel is odd.

Note (3) Input signal of even and odd clock should be the same timing.

5.2 LVDS DATA MAPPING TABLE

LVDS Channel		D7	D6	D4	D3	D2	D1	D0
LVDS Channel O0	LVDS output	D7	D6	D4	D3	D2	D1	D0
	Data order	OG0	OR5	OR4	OR3	OR2	OR1	OR0
LVDS Channel O1	LVDS output	D18	D15	D14	D13	D12	D9	D8
	Data order	OB1	OB0	OG5	OG4	OG3	OG2	OG1
LVDS Channel O2	LVDS output	D26	D25	D24	D22	D21	D20	D19
	Data order	DE	NA	NA	OB5	OB4	OB3	OB2
LVDS Channel O3	LVDS output	D23	D17	D16	D11	D10	D5	D27
	Data order	NA	OB7	OB6	OG7	OG6	OR7	OR6
LVDS Channel E0	LVDS output	D7	D6	D4	D3	D2	D1	D0
	Data order	EG0	ER5	ER4	ER3	ER2	ER1	ER0
LVDS Channel E1	LVDS output	D18	D15	D14	D13	D12	D9	D8
	Data order	EB1	EB0	EG5	EG4	EG3	EG2	EG1
LVDS Channel E2	LVDS output	D26	D25	D24	D22	D21	D20	D19
	Data order	DE	NA	NA	EB5	EB4	EB3	EB2
LVDS Channel E3	LVDS output	D23	D17	D16	D11	D10	D5	D27
	Data order	NA	EB7	EB6	EG7	EG6	ER7	ER6

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5.3 COLOR DATA INPUT ASSIGNMENT

The brightness of each primary color (red, green and blue) is based on the 8-bit gray scale data input for the color. The higher the binary input, the brighter the color. The table below provides the assignment of color versus data input.

Color		Data Signal Red								Green								Blue							
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
Basic Colors	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Cyan	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Magenta	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Gray Scale Of Red	Red(0) / Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(1)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(2)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Red(253)	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(254)	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gray Scale Of Green	Green(0) / Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	Green(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Green(253)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0
	Green(254)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
	Green(255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
Gray Scale Of Blue	Blue(0) / Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blue(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Blue(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Blue(253)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1
	Blue(254)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0
	Blue(255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

Note (1) 0: Low Level Voltage, 1: High Level Voltage

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6. INTERFACE TIMING

6.1 INPUT SIGNAL TIMING SPECIFICATIONS

The input signal timing specifications are shown as the following table and timing diagram.

Signal	Item	Symbol	Min.	Typ.	Max.	Unit	Note
	Frequency	Fc	58.54	74.25	97.98	MHz	-
	Period	Tc	-	13.47	-	ns	

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7. OPTICAL CHARACTERISTICS

7.1 TEST CONDITIONS

Item	Symbol	Value	Unit
Ambient Temperature	Ta	25±2	°C
Ambient Humidity	Ha	50±10	%RH
Supply Voltage	V_{CC}	5.0	V
Input Signal	According to typical value in "3. ELECTRICAL CHARACTERISTICS"		
Inverter Current	I_L	7.0±0.5	mA
Inverter Driving Frequency	F_L	55±5	KHz
Inverter	Logah MIT70070.50		

7.2 OPTICAL SPECIFICATIONS

The relative measurement methods of optical characteristics are shown in 7.2. The following items should be measured under the test conditions described in 7.1 and stable environment shown in Note (6).

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Color Chromaticity	Red	Rcx	$\theta_x=0°$, $\theta_Y=0°$ CS-1000T Standard light source "C"	Typ --0.03	0.657	Typ + 0.03		(0),(6)
		Rcy			0.330			
	Green	Gcx			0.282			
		Gcy			0.592			
	Blue	Bcx			0.146			
		Bcy			0.104			
	White	Wcx			0.325			
		Wcy			0.367			
Center Transmittance		T%	$\theta_x=0°$, $\theta_Y=0°$	5.8	6.5	-	%	(1), (5)
Contrast Ratio		CR	CS-1000T, CMO BLU	700	1000	-	-	(1), (3)
Response Time		T_R	$\theta_x=0°$, $\theta_Y=0°$	-	1.3	2.2	ms	(4)
		T_F		-	3.7	5.8	ms	
Transmittance uniformity		δT	$\theta_x=0°$, $\theta_Y=0°$ CS-1000T	-	1.1	1.3	-	(1), (7)
Viewing Angle	Horizontal	θ_x+	CR≥10 BM-5A	75	85	-	Deg.	(1), (2) (6)
		θ_x-		75	85	-		
	Vertical	θ_Y+		70	80	-		
		θ_Y-		70	80	-		

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Note (2) Definition of Viewing Angle (θx, θy):

Normal

$\theta x = \theta y = 0°$

$\theta y-$ $\theta y+$

$\theta x- = 90°$ x-

12 o'clock direction

y+ $\theta y+ = 90°$

$\theta x-$ $\theta x+$

6 o'clock

y-

$\theta y- = 90°$

x+ $\theta x+ = 90°$
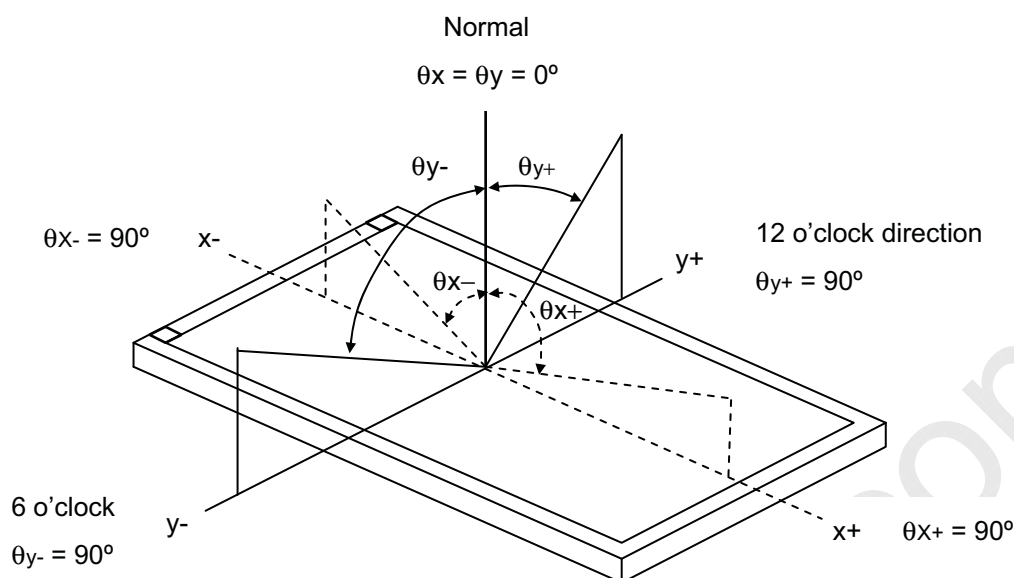
Note (3) Definition of Contrast Ratio (CR):

The contrast ratio can be calculated by the following expression.
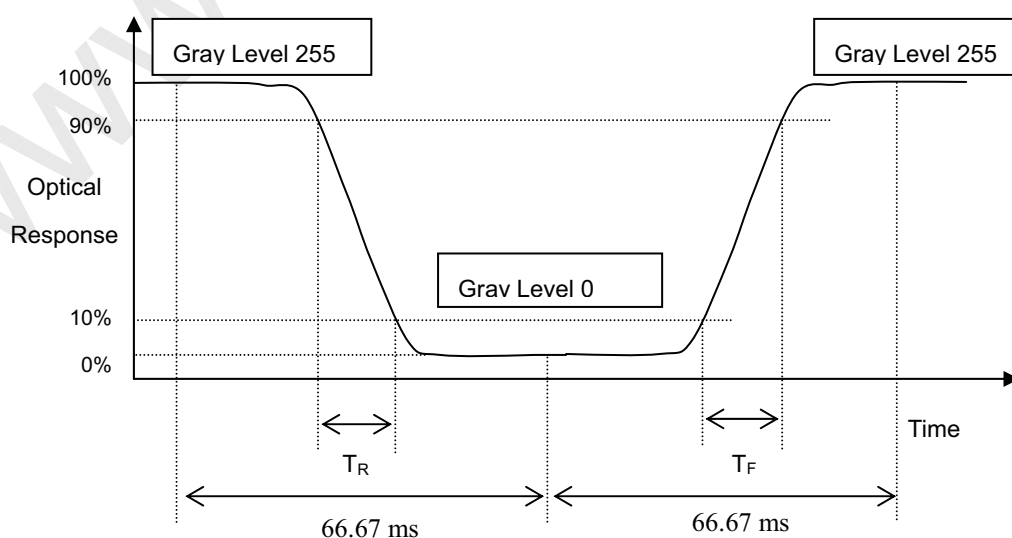
Contrast Ratio (CR) = L255 / L0

L255: Luminance of gray level 255

L 0: Luminance of gray level 0

CR = CR (5)

CR (X) is corresponding to the Contrast Ratio of the point X at Figure in Note (7).

Note (4) Definition of Response Time (T_R, T_F):

Gray Level 255   Gray Level 255

100%

90%

Optical

Response

Grav Level 0

10%

0%

Time

T_R T_F

66.67 ms   66.67 ms

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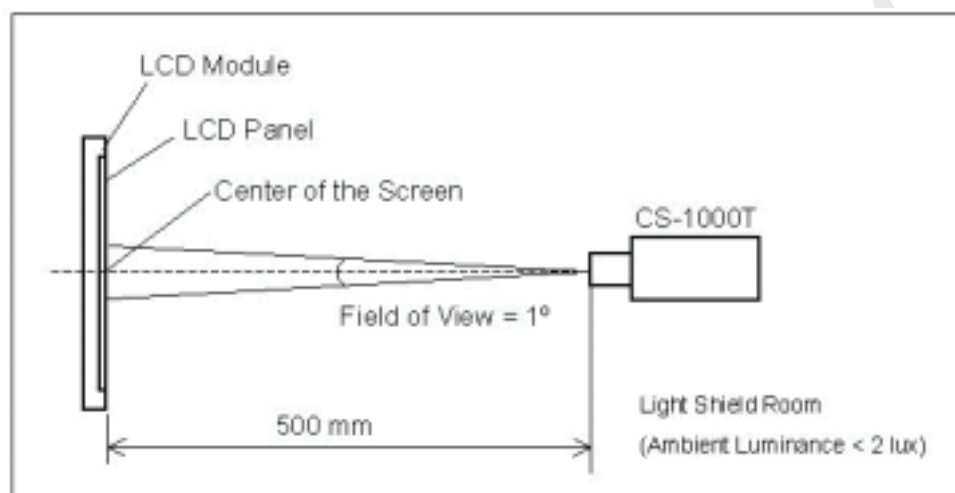Note (5) Definition of Transmittance (T%):

Module is without signal input.

L (X) and $L_{BLU}(X)$ is corresponding to the luminance of the point X at Figure in Note (7).

Note (6) Measurement Setup:

The LCD module should be stabilized at given temperature for 30minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 30minutes in a windless room.

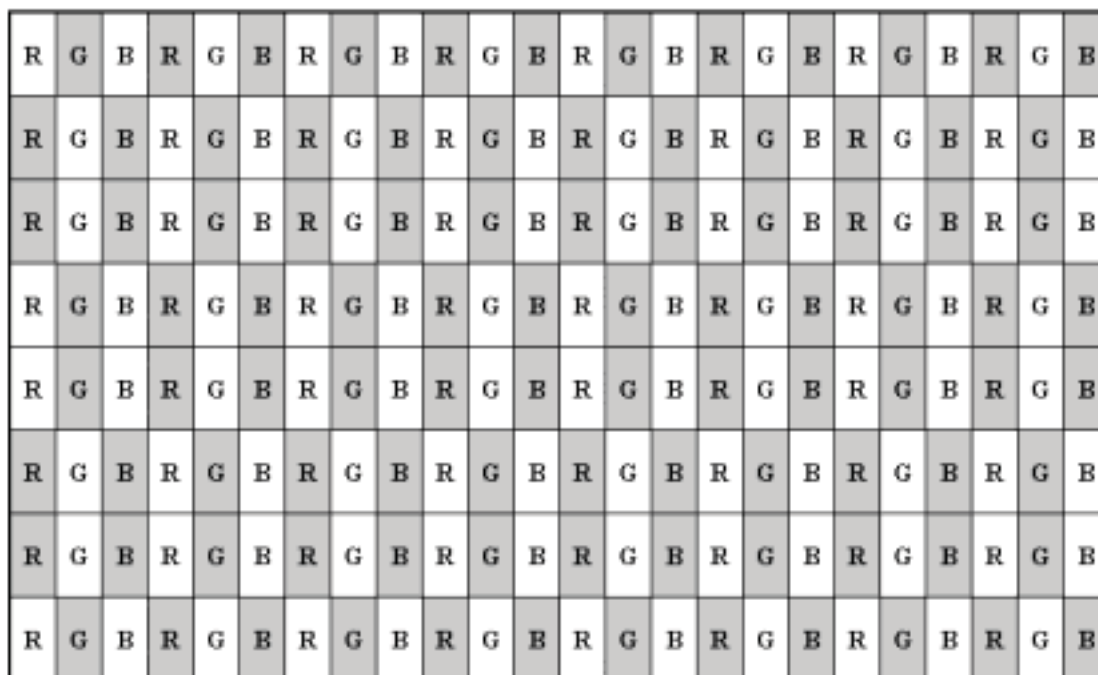Note (7) Definition of Transmittance Variation (δT%):

Measure the transmittance at 9 points

Maximum [T%(1), T%(2), … T%(9)]

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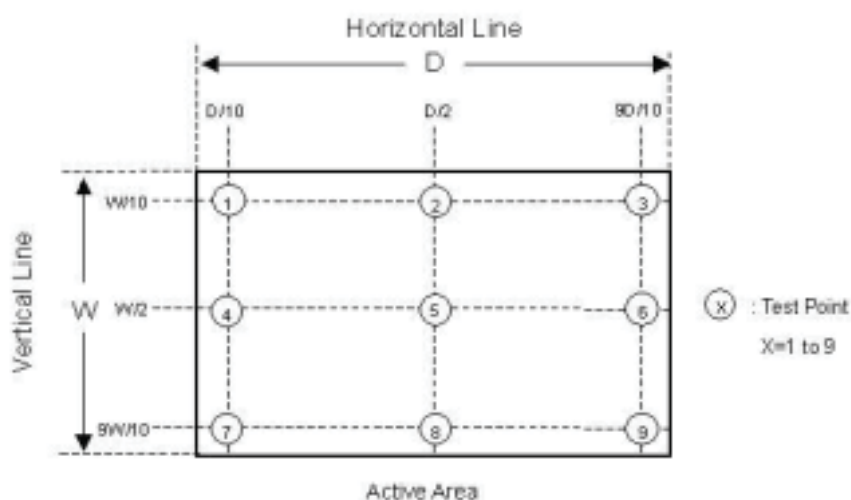
7.3 FLICKER ADJUSTMENT

(1) Adjustment Pattern: 2H1V checker pattern as follows.

L.128　　L0

(2) Adjustment Method:

Flicker should be adjusted by turning the volume for flicker adjustment by the ceramic driver. It is adjusted to the point with least flickering of the whole screen. After making it surely overrun at once, it should be adjusted to the optimum point.
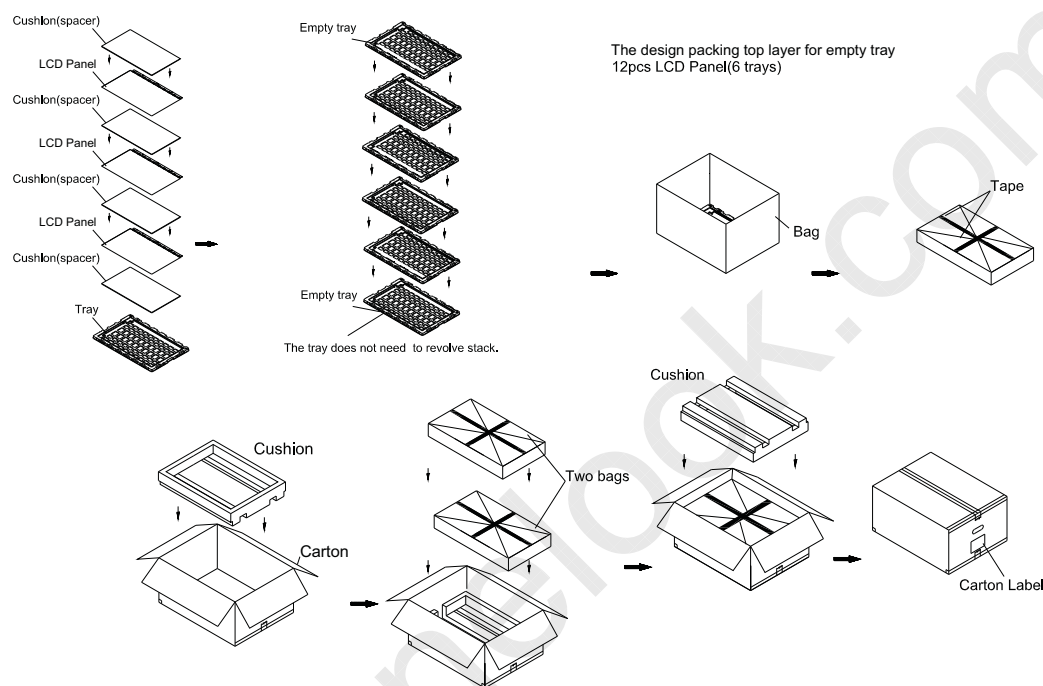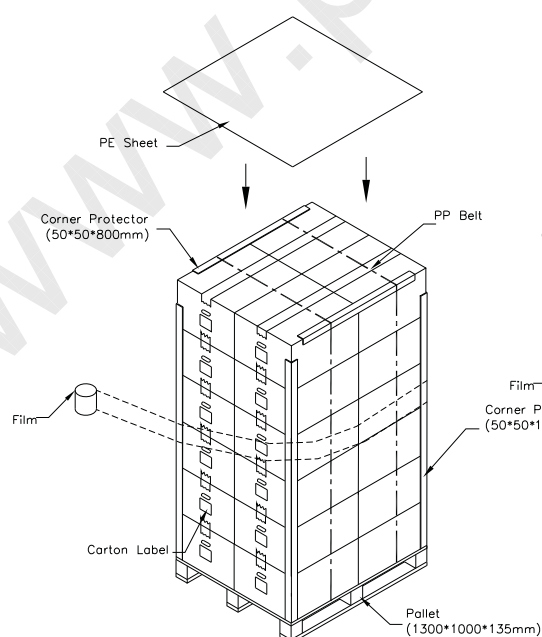
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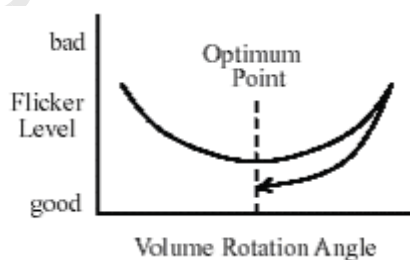
8. PACKAGING

8.1 PACKING SPECIFICATIONS

(1) 24 open cells / 1 Box

(2) Box dimensions: 650 (L) X 495 (W) X 320 (H) mm

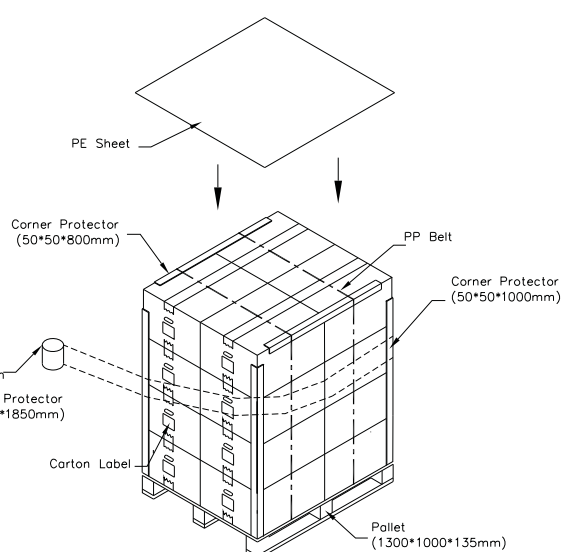(3) Weight: approximately 21 Kg (24 open cells per box/12 tray)

8.2 PACKING METHOD

(1) Carton dimensions : 650(L)x495(W)x320(H)mm

(2) Weight : Appro 21Kg(24 panels/12 trays)

Sea and Land Transportation   Air Transportation

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9. DEFINITION OF LABELS

9.1 CMO OPEN CELL LABEL

The barcode nameplate is pasted on each module as illustration, and its definitions are as following explanation.

Barcode definition:

Serial ID: CM-L5H11-X-X-X-XX-L-XX-L-YMD-NNNN

Code	Meaning	Description
CM	Supplier code	CMO=CM
L5H11	Model number	M215H1-P01=L5H11
X	Revision code	C1:1, C2:2,…
X	Source driver IC code	Century=1, CLL=2, Demos=3, Epson=4, Fujitsu=5, Himax=6, Hitachi=7, Hynix=8, LDI=9, Matsushita=A, NEC=B, Novatec=C, OKI=D, Philips=E, Renasas=F, Samsung=G, Sanyo=H, Sharp=I, TI=J, Topro=K, Toshiba=L, Windbond=M
X	Gate driver IC code	
XX	Cell location	Tainan, Taiwan=TN
L	Cell line #	0~12=1~C
XX	Module location	Tainan, Taiwan=TN
L	Module line #	0~12=1~C
YMD	Year, month, day	Year: 2001=1, 2002=2, 2003=3, 2004=4… Month: 1~12=1, 2, 3, ~, 9, A, B, C Day: 1~31= 1, 2, 3, ~, 9, A, B, C, ~, T, U, V
NNNN	Serial number	Manufacturing sequence of product

9.2 CARTON LABEL

The barcode nameplate is pasted on each box as illustration, and its definitions are as following explanation

(1) Model Name: M215H1–P01

(2) Carton ID: CMO internal control

(3) Quantities: 24 pcs

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10. RELIABILITY TEST

Environment test conditions are listed as following table.

Items	Required Condition	Note

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11. PRECAUTIONS

11.1 ASSEMBLY AND HANDLING PRECAUTIONS

(1) Do not apply rough force such as bending or twisting to the product during assembly.

(2) To assemble or install module into user's system can be only in clean working areas. The dust and oil may cause electrical short or worsen the polarizer.

(3) It is not permitted to have pressure or impulse on the product because the LCD panel will be damaged.

(4) Always follow the correct power sequence when the product is connecting and operating. This can prevent damage to the CMOS LSI chips during latch-up.

(5) Do not pull the I/F connector in or out while the module is operating.

(6) Use a soft dry cloth without chemicals for cleaning, because the surface of polarizer is very soft and easily scratched.

(7) It is dangerous that moisture come into or contacted the product, because moisture may damage the product when it is operating.

(8) High temperature or humidity may reduce the performance of module. Please store this product within the specified storage conditions.

(9) When ambient temperature is lower than 10ºC may reduce the display quality. For example, the response time will become slowly.

11.2 SAFETY PRECAUTIONS

(1) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contact with hands, skin or clothes, it has to be washed away thoroughly with soap.

(2) After the product's end of life, it is not harmful in case of normal operation and storage.

11.3 OTHER

(1) When fixed patterns are displayed for a long time, remnant image is likely to occur.

12. MECHANICAL DRAWING

Version 2.1

Active Area 476.64X268.11